Advancements in Synthetic Biology

Artemisinin, Curing Malaria all around the World

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The Earth's resources would one day no longer exist because of the rapid growth of the word's populations. However, the environment provides us with a natural habitat to which the human civilizations have adapted to. Since the introduction and study of synthetic biology, humans have been able to find an engineering approach to biological factors (Rock .D, 2014). Just like engineers build bridges and know that it would be able to perform a specific function, scientists are now able to seek to find particular biological parts in a modified or artificial cell.

As the emerging field of synthetic biology has a broad scope, it is becoming a fundamental area of research. Much advancement like in biomedicine, a new chapter for obtaining resources has been opened. Systems in biology require high technological tools such as bio-informatics, and experimental techniques for exploring gene interactions. The chemical modifications of different objects like proteins and splicing and rearranging genetic information of DNA, has advanced to a higher stage where life could possibly be redesigned in the future vastly (Krassnig, et al., 2005). Who knows? Crops may not take as long to grow; food may be grown with using only small amounts of water, diseases may not last anymore and humans may be able to hold more memory; all due to greater advancements in genetic modifications in synthetic biology.

Scientists have been trying to manipulate genes for decades, inserting, deleting and changing them into various microbes. Now, because of extensive research and investigations being performed, scientists intend to construct genes and new forms of life from scratch.

Before humans start creating new forms of life, it is important that lives are first saved from disastrous endemic diseases which slowly kill large populations of the Earth. One of the most reoccurring diseases is Malaria and according to the World Health Organization, there were 247 million cases of Malaria in 2008 with over one million of the victims killed the same year (Unknown, Malaria, 2014). Many Governments around the world state that any measures can be taken to safe human lives, and once again this has been implanted.

The only key player to take care of this disease is artemisinin. This is produced by the plant Artemisia Annuna, and this is currently the only antimalarial drug known. This drug has not kept up with its demand and WHO warns that (Unknown, Malaria, 2014), "The public health consequences could desire, as no alternative antimalarial medicines will be available in the future." Even though there are multiple cultivation plants for this species only, they are not able to meet up with worldwide demand, and certainly some low socio-

economic societies would not be able to afford this drug as it has high demand and low supply.

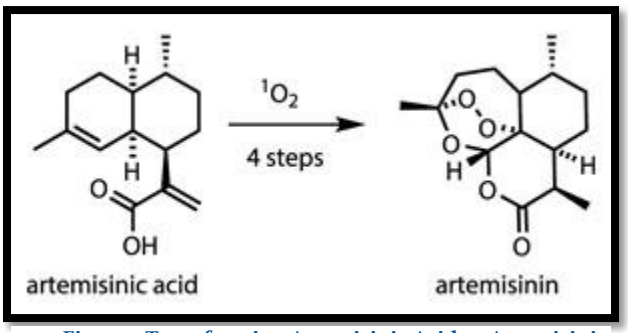

Figure 1 Transforming Artemisinic Acid to Artemisinin (Peplow .M , 2013)

The most promising advancement in synthetic biology took place in 2013, when the Amyris Incorporation developed the semi-synthetic imitation of most powerful antimalarial drug to fight and cure malaria in all cases; lab manufactured Artemisinin. Fortunately this lab-generated drug precursor takes just 3 months to be manufactured whereas the original acid takes up to 18 months to be grown and extracted (Unknown, 2013). The semi-synthetic Artemisinin is developed in a way it gets or restraints yeast to pump out artemisinic acid which is the precursor (a substance from which another is formed especially because of a metabolic reaction), rather than extracting it from the original plant, Artemisia Annuna or commonly known as the Sweet Wormwood Plant. The acid once obtained is formed into a drug (Antesuate) through pharmaceutical companies such as Sanofi. When this is mixed with other drugs, it is known as the Artemisinin Combination Therapy or ACT (Sanders .R, 2013). Even though the malaria parasite is unusually building a resistance to it, there are many solutions to confront the resistance by mixing the drug with other drugs, overall changing the chemical formulation.

Since the Artemisinin drug is created from yeast, Amyris Co-Founder Jay Keasling states that, "it will certainly bring the prices down." This would allow it to be accessible to everyone and will be able to save more lives every day. The African countries certainly appreciated the high supply. Inserting a dozen or more genes into microbes to make more drugs would be difficult and include many risks however the positives would always be beneficial.

Since the introduction of this drug in the disease, multitudinous lives have been saved allowing any community to grow at a faster rate; more births, less deaths. This is undoubtedly the most promising advancement in synthetic biology as it saves lives, allows communities to expand, it's cheap and affordable by everyone in third-world countries. Viewing as this drug is cheap; it differentiates from other high-class treatments as it provides the same service, more effectively and at a more affordable rate. Other advancements such as renewable rubber (Bomgardener .M, 2014) aren't as important as they do not contribute to saving lives.

Synthetic biology allows humans to manipulate life forms like engineers design new machines, or transportation devices. There are however many risks involved with changing life forms and synthesizing whole genomes. However measures can be taken to

minimize risks, interacting with the nature in the course of changing how it operates may lead to disastrous outcomes. Playing around with nature isn't always positive. Many technologies being used have the potential of being extremely dangerous and the release or emission of harmful and toxic organisms can be accounted for. These processes would disrupt the nature's cycle and could lead to a future interface.

The key aspect being emphasised is that humans could soon be able to harness the world in their way and the study of synthetic biology is helpful in every area, from saving lives to creating new life forms. It is a major investment and could dramatically revolutionize all fields. In other words it would be like modifying existing pathways in nature's way. Semi-synthetic Artemisinin is unquestionably the most promising advancement in synthetic biology for many reasons.

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